

3875081 G E SOLID STATE

01E 17415 D T. 33-11

General-Purpose Power Transistors

File Number 676

2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

T. 33-19

Epitaxial-Base, Silicon N-P-N and P-N-P VERSAWATT Transistors

General-Purpose Medium-Power Types for Switching and Amplifier Applications

Features:

- Low saturation voltages
- Complementary n-p-n and p-n-p types
- Maximum safe-area-of-operation curves specified for dc operation

The RCA-2N6106-2N6111, 2N6288-2N6293, and 2N6473-2N6476 are epitaxial-base silicon transistors supplied in a VERSAWATT package. The 2N6288-2N6293, 2N6473, and 2N6474* are n-p-n complements of p-n-p types 2N6106-2N6111, 2N6475, and 2N6476[‡], respectively. All these transistors are intended for a wide variety of medium-power switching and amplifier applications, such as series and shunt regulators and driver and output stages of high-fidelity amplifiers.

The 2N6289, 2N6291, and 2N6293 n-p-n types and 2N6106, 2N6108, and 2N6110 p-n-p devices fit into TO-213AA sockets. The remaining types are supplied in the JEDEC TO-220AB straight-lead version of the VERSAWATT package. All of these devices are also available on special order in a variety of lead-form configurations.

*Formerly RCA Dev. Nos. TA7784, TA8323, TA7783, TA8232, TA7782, TA8231, TA8444, and TA8723, respectively.

[‡]Formerly RCA Dev. Nos. TA8210, TA7741, TA8211, TA7742, TA8212, TA7743, TA8445, and TA8722, respectively.

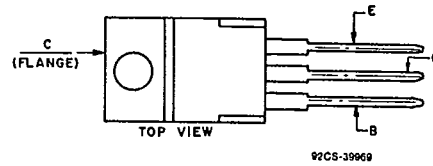
MAXIMUM RATINGS, Absolute-Maximum Values:

	2N6288		2N6290		2N6292		
	N-P-N	2N6289	2N6291	2N6293	2N6473	2N6474	
	P-N-P	2N6110 [‡]	2N6108 [‡]	2N6106 [‡]	2N6475 [‡]	2N6476 [‡]	
		2N6111 [‡]	2N6109 [‡]	2N6107 [‡]			
V _{CEO}		40	60	80	110	130	V
V _{CEX(SUS)} R _{BB} = 100 Ω, V _{EB} = 0 V.....		40	60	80	110	130	V
V _{CEO(SUS)}		30	50	70	100	120	V
V _{EB0}				5			V
I _C (T _C ≤ 106°C).....			7			4	A
I _E (T _C ≤ 130°C).....			3			2	A
P _T							
T _C ≤ 25°C.....				40			W
T _C > 25°C ≤ 100°C.....				16			W
T _C > 25°C.....				Derate linearly 0.32			W/°C
T _A ≤ 25°C.....				1.8			W
T _A > 25°C.....				Derate linearly 0.0144			W/°C
T _{stg} , T _J				-65 to 150			°C
T _L							
At distances ≥ 1/8 in. (3.17 mm) from case for 10 s max.				235			°C

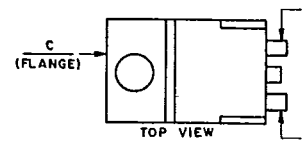
[‡]In accordance with JEDEC registration data.

[‡]For p-n-p devices, voltage and current values are negative.

TERMINAL DESIGNATIONS



JEDEC TO-220AB



JEDEC TO-220AA

Directory

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2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

ELECTRICAL CHARACTERISTICS At Case Temperature (T_C) = 25°C Unless Otherwise Specified

CHARACTERISTIC	TEST CONDITIONS ^a				LIMITS						UNITS	
	VOLTAGE V dc		CURRENT A dc		2N6292 2N6293		2N6290 2N6291		2N6288 2N6289			
	V _{CE}	V _{BE}	I _C	I _B	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
I _{CER} (R _{BE} = 100 Ω)	75 55 35				-	0.1	-	-	-	-		
(R _{BE} = 100 Ω, T _C = 150°C)	70 50 30				-	2	-	-	-	-	0.1	
* I _{CEX} (R _{BE} = 100 Ω)	75 56 37.5	-1.5 -1.5 -1.5			-	0.1	-	-	-	-		
(R _{BE} = 100 Ω, T _C = 150°C)	70 50 30	-1.5 -1.5 -1.5			-	2	-	-	-	-	0.1	
* I _{CEO}	60 40 20			0 0 0	-	1	-	-	-	-		
* I _{EBO}		-5	0		-	1	-	1	-	-	1	
* V _{CEO(sus)} ^b			0.1 ^a	0	70	-	50	-	30	-	V	
V _{CER(sus)} ^b (R _{BE} = 100 Ω)			0.1 ^a		80	-	60	-	40	-	V	
* h _{FE}	4 4 4 4		2 ^a 2.5 ^a 3 ^a 7 ^a		30 - - 2.3	150 - - -	- 30 - 2.3	- 150 - -	- - 30 2.3	- - 150 -		
* V _{BE}	4 4 4 4		2 ^a 2.5 ^a 3 ^a 7 ^a		- - - -	1.5 - - 3	- - - -	- 1.5 - 3	- - - -	- - 1.5 3	V	
* V _{CE(sat)}			2 ^a 2.5 ^a 3 ^a 7 ^a	0.2 0.25 0.3 3	- - - -	1 - - 3.5	- - - -	- 1 - 3.5	- - - -	- - 1 3.5		
* h _{fe} (f = 1 MHz)	4		0.5		4	-	4	-	4	-		
2N6288-93												
2N6106-11	-4		-0.5		10	-	10	-	10	-		
* h _{fe} (f = 50 kHz)	4		0.5		20	-	20	-	20	-		
f _T											MHz	
2N6288-93	4		0.5		10	-	10	-	10	-		
2N6106-11	-4		-0.5		10	-	10	-	10	-		
* C _{obo} (f = 1 MHz)	10 ^c		0		-	250	-	250	-	250	pF	
R _{θJC}					-	3.125	-	3.125	-	3.125	C/W	
R _{θJA}					-	70	-	70	-	70	C/W	

^a In accordance with JEDEC registration data.
^b Pulsed: Pulse duration = 300 μs, duty factor = 0.018.
^c V_{CB} value.
^d For p-n-p devices, voltage and current values are negative.
CAUTION: The sustaining voltage V_{CEO(sus)} and V_{CER(sus)} **MUST NOT** be measured on a curve tracer.

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2N6106-2N6111, 2N6288-2N6293, 2N6473-2N6476

ELECTRICAL CHARACTERISTICS At Case Temperature (T_C) = 25°C Unless Otherwise Specified

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CHARACTERISTIC	TEST CONDITIONS				LIMITS				UNITS
	VOLTAGE V dc		CURRENT A dc		2N6474 2N6476*		2N6473 2N6475*		
	V _{CE}	V _{BE}	I _C	I _B	Min.	Max.	Min.	Max.	
I _{CER} (R _{BE} = 100 Ω)	120				-	0.1	-	-	mA
	100				-	-	-	0.1	
(R _{BE} = 100 Ω T _C = 100°C)	120				-	2	-	-	
	100				-	-	-	2	
* I _{CEx} (R _{BE} = 100 Ω)	120	-1.5			-	0.1	-	-	
	100	-1.5			-	-	-	0.1	
(R _{BE} = 100 Ω, T _C = 100°C)	120	-1.5			-	2	-	-	
	100	-1.5			-	-	-	2	
* I _{CEO}	60			0	-	1	-	-	
	50			0	-	-	-	1	
* I _{EBO}		-5		0	-	1	-	1	
* V _{CEO(sus)} ^b			0.1 ^a	0	120	-	100	-	V
V _{CER(sus)} ^b (R _{BE} = 100 Ω)			0.1 ^a		130	-	110	-	
* h _{FE}	4		1.5 ^a		15	150	15	150	V
	2.5		4 ^a		2	-	2	-	
* V _{BE}	4		1.5 ^a		-	2	-	2	V
	2.5		4 ^a		-	3.5	-	3.5	
* V _{CE(sat)}			1.5 ^a	0.15	-	1.2	-	1.2	V
			4 ^a	2	-	2.5	-	2.5	
* h _{fe} (f = 1 MHz) 2N6473-74	4		0.5		4	-	4	-	MHz
	-4		-0.5		5	-	5	-	
* h _{fe} (f = 50 kHz)	4		0.5		20	-	20	-	
	-4		-0.5		5	-	4	-	
* f _T 2N6473-74	4		0.5		4	-	4	-	MHz
	-4		-0.5		5	-	4	-	
* C _{obo} (f = 1 MHz)	10 ^c		0		-	250	-	250	pF
R _{θJC}					-	3.125	-	3.125	°C/W
R _{θJA}					-	70	-	70	°C/W

* In accordance with JEDEC registration data

^a Pulsed: Pulse duration = 300 μs, duty factor = 0.018.

^b CAUTION: The sustaining voltage V_{CEO(sus)} are V_{CER(sus)} MUST NOT be measured on a curve tracer.

^c V_{CB} value.

♦ For p-n-p devices, voltage and current values are negative.

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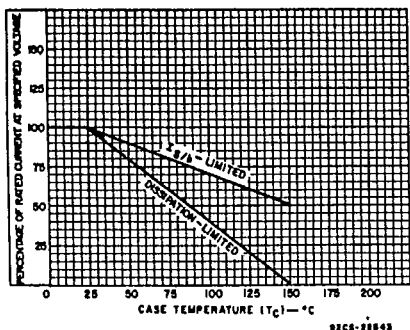


Fig. 1 - Current derating curves for all types.

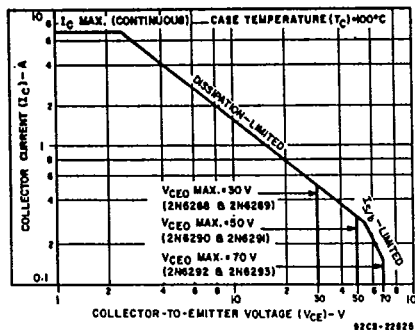


Fig. 2 - Maximum operating areas for 2N6288 - 2N6293 ($T_C = 100^\circ C$).

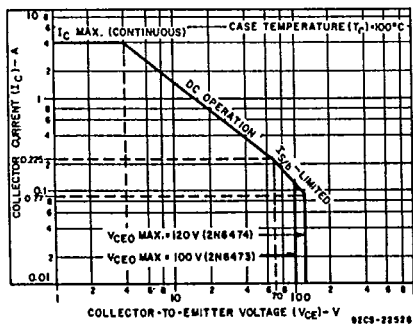


Fig. 3 - Maximum operating areas for 2N6473 - 2N6474 ($T_C = 100^\circ C$).

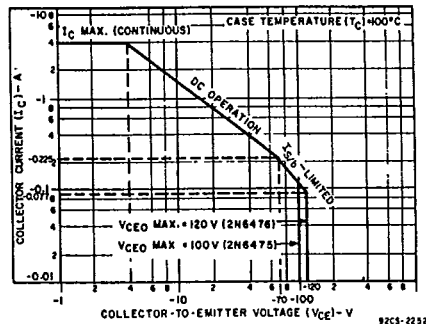


Fig. 4 - Maximum operating areas for 2N6475 and 2N6476 ($T_C = 100^\circ C$).

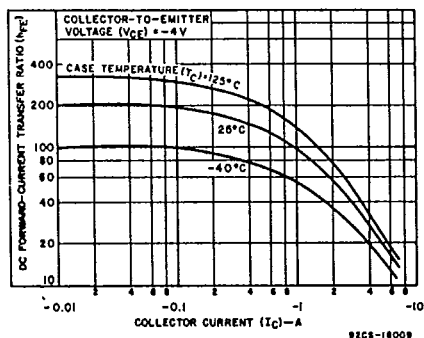


Fig. 5 - Typical dc beta characteristics for 2N6106 - 2N6111.

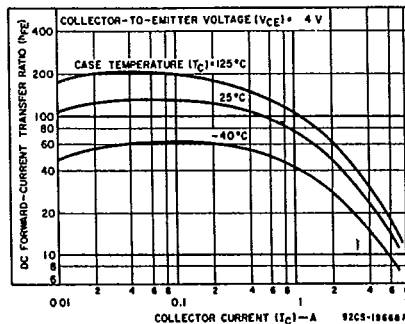


Fig. 6 - Typical dc beta characteristics for 2N6288 - 2N6293.

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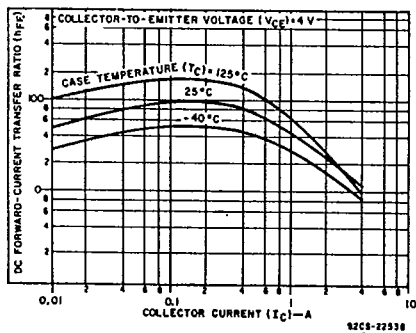


Fig. 7 - Typical dc beta characteristics for 2N6473 and 2N6474.

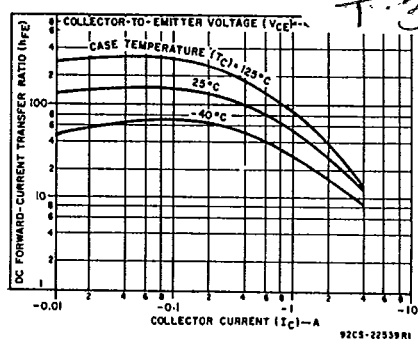


Fig. 8 - Typical dc beta characteristics for 2N6475 and 2N6476.

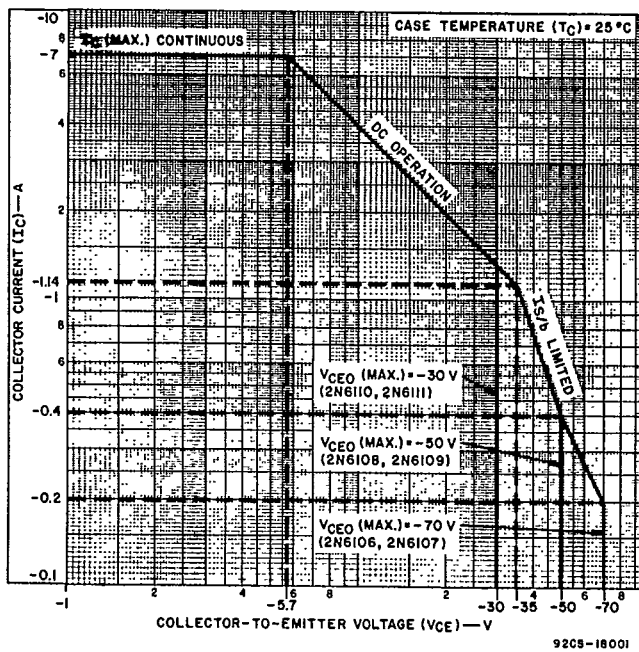


Fig. 9 - Maximum operating areas for 2N6106 - 2N6111 ($T_C = 25^\circ C$).

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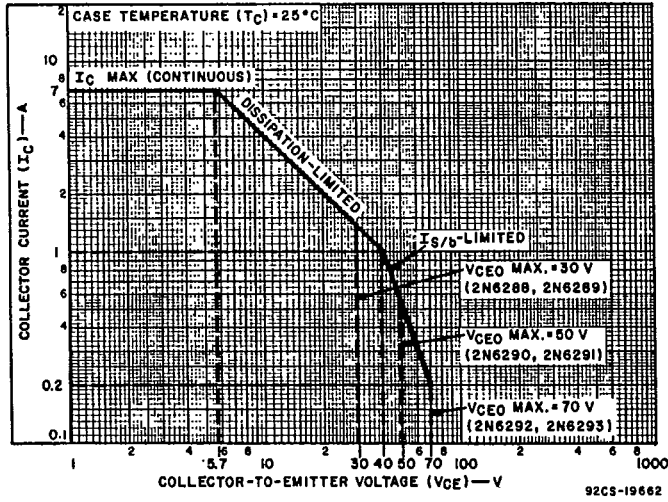


Fig. 10 - Maximum operating areas for 2N6288-2N6293 ($T_C = 25^\circ C$).

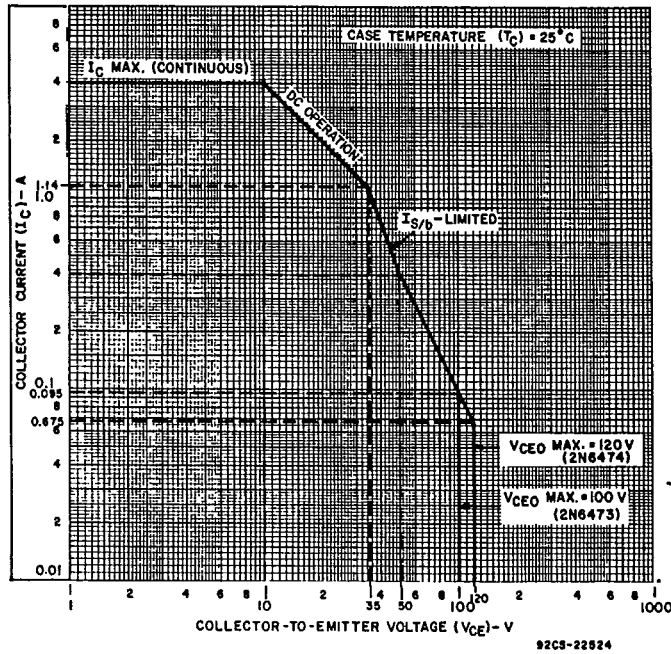


Fig. 11 - Maximum operating areas for 2N6473 and 2N6474 ($T_C = 25^\circ C$).

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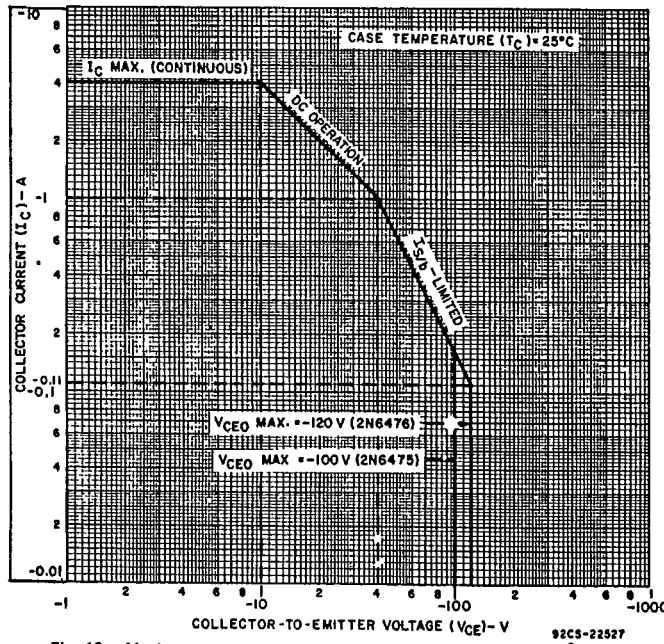


Fig. 12 - Maximum operating areas for 2N6475 - 2N6476 ($T_c = 25^\circ C$).

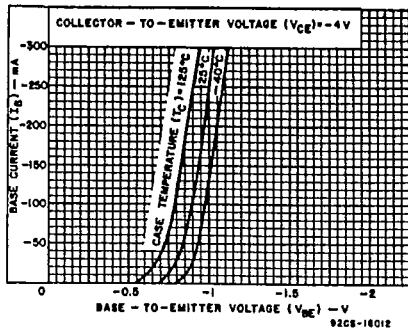


Fig. 13 - Typical input characteristics for 2N6106 - 2N6111, 2N6475, and 2N6476.

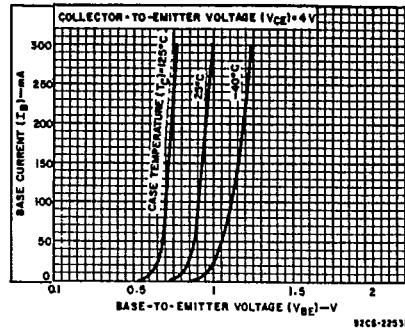


Fig. 14 - Typical input characteristics for 2N6288 - 2N6293.

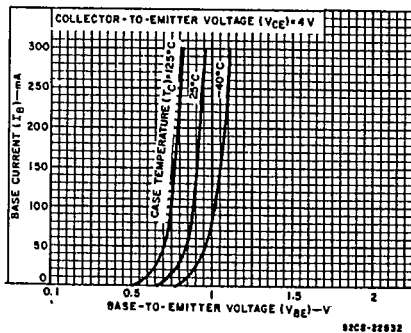


Fig. 15 - Typical input characteristics for 2N6473 - 2N6474.

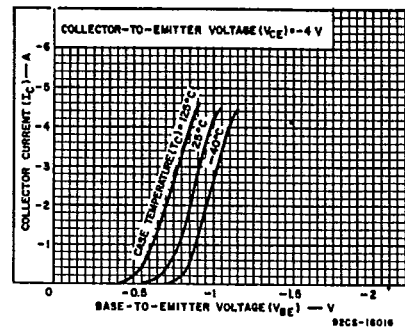


Fig. 16 - Typical transfer characteristics for 2N6106 - 2N6111.

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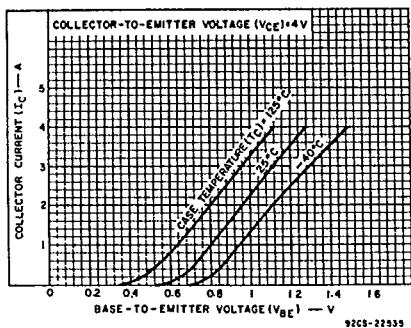


Fig. 17 - Typical transfer characteristics for 2N6288 - 2N6293.

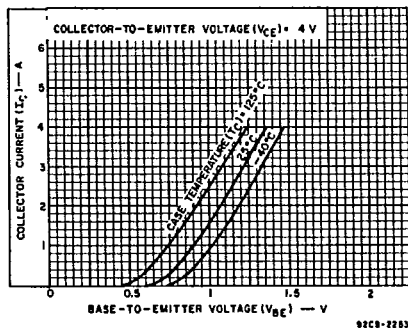


Fig. 18 - Typical transfer characteristics for 2N6473 and 2N6474.

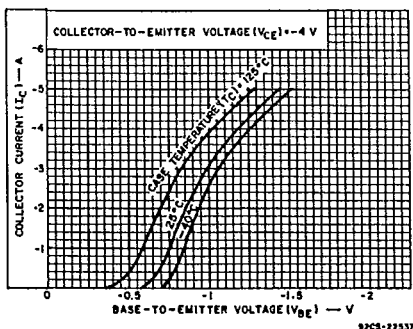


Fig. 19 - Typical transfer characteristics for 2N6475 and 2N6476.

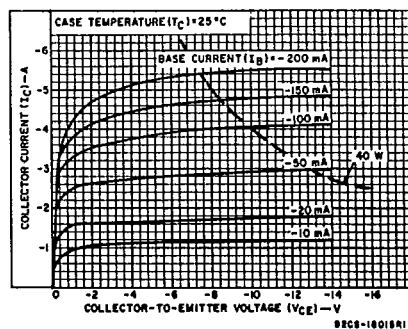


Fig. 20 - Typical output characteristics for 2N6106 - 2N6111.

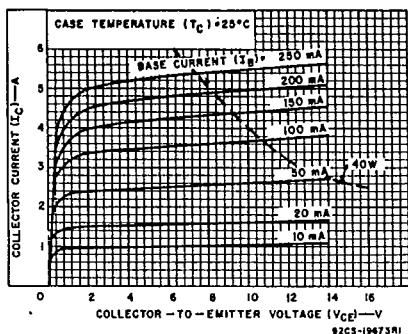


Fig. 21 - Typical output characteristics for 2N6288 - 2N6293.

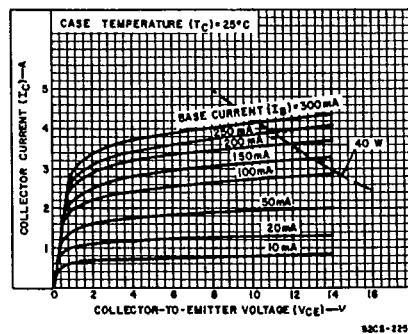


Fig. 22 - Typical output characteristics for 2N6473 and 2N6474.

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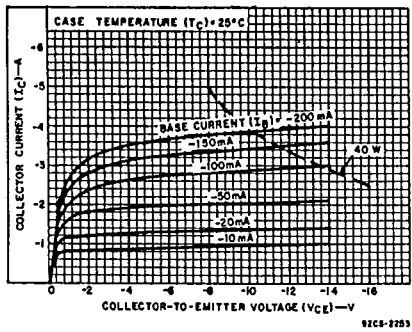


Fig. 23 - Typical output characteristics for 2N6475 and 2N6476.

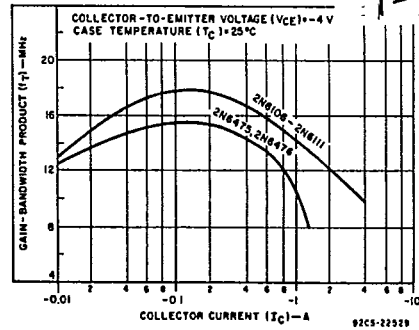


Fig. 24 - Typical gain-bandwidth product 2N6106 - 2N6111, 2N6475, and 2N6476.

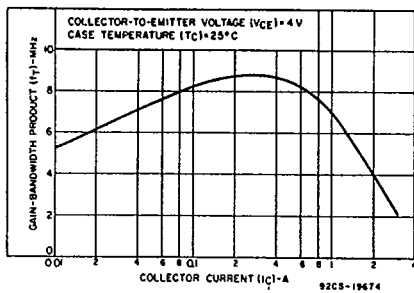


Fig. 25 - Typical gain-bandwidth product for 2N6288 - 2N6293.

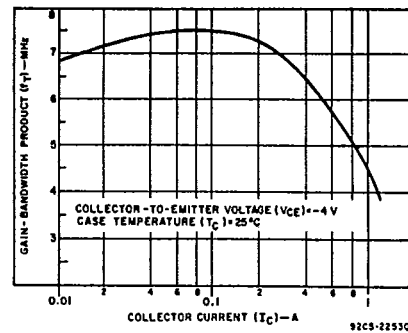


Fig. 26 - Typical gain-bandwidth product for 2N6473 and 2N6474.

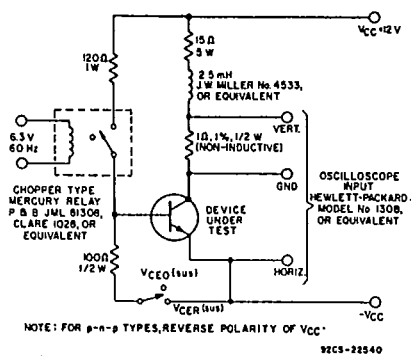
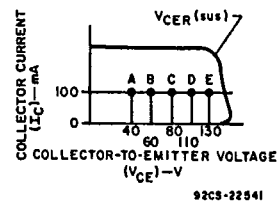


Fig. 27 - Circuit used to measure sustaining voltage $V_{CE R(sus)}$ for all types.



Note: Curve will be inverted and polarity reversed for p-n-p types. The sustaining voltage, $V_{CE R(sus)}$, is acceptable when the traces fall to the right and above the designated points:
Point A: 2N6110, 2N6111, 2N6288, 2N6289
Point B: 2N6108, 2N6109, 2N6290, 2N6291
Point C: 2N6106, 2N6107, 2N6292, 2N6293
Point D: 2N6475, 2N6473
Point E: 2N6476, 2N6474

Fig. 28 - Oscilloscope delay for measurement of sustaining voltage (test circuit shown in Fig. 27).